Abstract

A process for the utilization of a fuel having an initial boiling temperature or prevailing initial boiling temperature range at 1 bar of between 231 K and 830 K, characterized by the following features:

(a) the fuel is contacted with at least one oxidant preheated to from 520 K to 880 K at a pressure, p, of ≥ 1 bar, or at a lower pressure with a reduction of the temperature range, and a C/O molar ratio of between 1:0.14 and 1:25 in a reaction space to initiate exothermic prereactions in the form of a cool flame which cause only partial conversion of the fuel and oxidant even when the fuel and oxidant are homogeneously mixed; and

(b) a kinetic reaction inhibition of the further reaction of the oxidizable mixture formed in the cool flame is provided by adjusting a technically relevant dwelling time t_v of the mixture prepared in step (a) in the reaction space of $t_v > 25$ ms at $p \leq 1$ bar, and dwelling times which become shorter when the pressure is increased under otherwise equal conditions, and a limited heat dissipation from the reaction zone through an inert gas stream with a ratio of the heat capacity flow of the oxidant, $\dot{M} \cdot c_p$, to the product of fuel mass flow, $\dot{M}_b$, and heating value, H_u, which is, in the adiabatic reaction space, $\dot{M} \cdot c_p / \dot{M}_b \cdot H_u > 2 \cdot 10^{-4}\ K^{-1}$, and/or through the reactor wall with a heat flow density, $\dot{q}$, of $\dot{q} < 85\ kW/m^2$, whereby auto-ignition of the mixture is prevented, especially for a predictable period of time.